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- (72) Inventor; and
- (71) Applicant : ROBINSON, James C. [US/US]; 3045 Paces Lake Court, Atlanta, Georgia 30339 (US).
- (74) Agent: DOVALE, Anthony; FisherBroyles LLP, 885 Woodstock Road, Suite 430-383, Roswell, Georgia 30075 (US).
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(54) Title: SPINOUS PROCESS FIXATION APPARATUS AND METHOD

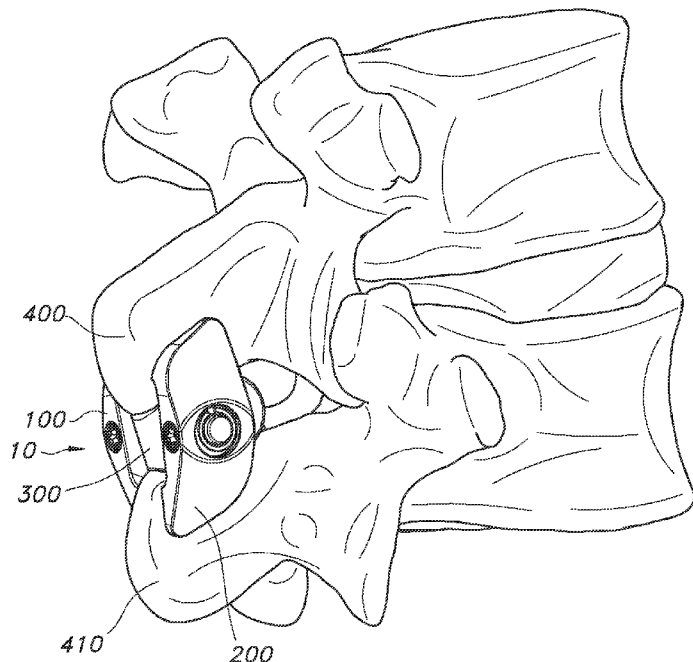


FIG. 1

(57) Abstract: An implantable device and method for fixation of spinous processes is presented. The device has first and second spaced plates configured for attachment to portions of adjacent spinous processes. The device can also have an implant configured for insertion between two adjacent spinous processes, but need not necessarily. The method has the steps of assembling the components of the implantable device and otherwise inserting them into position onto, between, and/or adjacent two desired spinous processes.

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SPINOUS PROCESS FIXATION APPARATUS AND METHOD

Field of the Invention

[0001] This invention relates generally to spinal surgery, and more particularly to devices for stabilization of the spine in association with placement of an interbody construct for interbody fusion or the like.

Background of the Invention

[0002] Varieties of interbody fusion devices are widely used following partial or total discectomies for stabilization of the spine at the site. Some stabilization devices are anchored to the pedicles. With several systems, the use of the pedicles requires screws or other anchoring devices that occupy significant space and involve muscle dissection and associated work-time for implantation. Nerve root injuries are a well-known potential complication of placement of screws in the pedicles.

[0003] The interspinous process devices are designed to increase the interspinous process height, thereby increasing the sagittal cross-sectional area of the foramen, where the nerve roots pass away out of the spine. It is thought that these devices may also unload the facet joints, and perhaps the intervertebral disc. They may limit spinal extension. This backward bending position may be painful for patients with spinal stenosis because it reduces the space available for the nerve roots in the exiting foraminal openings.

[0004] In addition to interspinous process implants, interspinous process fixation devices are also common to fix adjacent spinous processes to each other to stabilize the spinal motion-segment as an adjunct to spinal fusion. Current systems include spinous process plates that are fixed with adjacent spinous processes sandwiched therebetween.

SUMMARY

[0005] Presented herein is an implantable device for fixation of spinous processes. The device comprises first and second spaced plates configured for attachment to portions of adjacent spinous processes. In one aspect, each plate has a first and second surface, whereby the first surface of the first plate is configured to face the second surface of the second plate.

[0006] In another aspect, the device comprises an implant with a first face, an opposed second face, a top portion, and a bottom portion. The implant is configured for insertion between two adjacent spinous processes. In one aspect, the implant is an interbody cage. When positioned, the first face of the implant faces the first surface of the first plate and the second face of the implant faces the second surface of the second plate. In this aspect, the first plate is connected to a portion of the implant substantially adjacent the first face, and the second plate is connected to a portion of the implant substantially adjacent the second face. It is understood that implants of varying size and shape are disclosed herein, as well as alternate embodiments with no implant.

[0007] In addition to the implantable device described herein, presented herein is a method of fixation of spinous processes of a subject. In one aspect, the method comprises assembling the components of the implantable device (*i.e.* the first and second plates, and the implant), exposing at least one desired spinous process, inserting the implant between two adjacent spinous processes, joining the first and second plates to the implant with a portion of the spinous processes being therebetween, compressing the plates onto the first and second spinous processes, and maintaining the compression of the plates while affixing the plates with respect to the implant.

[0008] Related methods of operation are also provided. Other apparatuses, methods, systems, features, and advantages of the interspinous process device and the method of its use will be or become apparent to one with skill in the art upon examination of the following figures and detailed description. It is intended that all such additional apparatuses, methods, systems, features, and advantages be included within this description, be within the scope of the interspinous process device and the method of its use, and be protected by the accompanying claims.

DESCRIPTION OF THE FIGURES

[0009] The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate certain aspects of the instant invention and together with the description, serve to explain, without limitation, the principles of the invention. Like reference characters used therein indicate like parts throughout the several drawings.

- [0010]** FIG. 1 is a perspective view of one aspect of an implantable device for the fixation of spinous processes, shown in-situ between first and second spinous processes;
- [0011]** FIG. 2 is a perspective view of one aspect of the implantable device of FIG. 1;
- [0012]** FIG. 3 is a rear elevational view of the implantable device of FIG. 2;
- [0013]** FIG. 4 is right side view of the implantable device of FIG. 2;
- [0014]** FIG. 5 is a plan view of the implantable device of FIG. 2;
- [0015]** FIG. 6 is cross-sectional bottom elevational view of the implantable device of FIG. 2, cut along line 6-6 in FIG. 3;
- [0016]** FIG. 7 is an exploded perspective view of the implantable device of FIG. 2;
- [0017]** FIG. 8 is a perspective view of one aspect of the implantable device for the fixation of spinous processes;
- [0018]** FIG. 9 is a rear elevational view of the implantable device of FIG. 8;
- [0019]** FIG. 10 is right side view of the implantable device of FIG. 8;
- [0020]** FIG. 11 is a plan view of the implantable device of FIG. 8;
- [0021]** FIG. 12 is cross-sectional bottom elevational view of the implantable device of FIG. 8, cut along line 12-12 in FIG. 9;
- [0022]** FIG. 13 is an exploded perspective view of the implantable device of FIG. 8;
- [0023]** FIG. 14 is a perspective view of one aspect of the implantable device for the fixation of spinous processes showing one aspect with at least one substantially flexible post;
- [0024]** FIG. 15 is a rear elevational view of the implantable device of FIG. 14;
- [0025]** FIG. 16 is right side view of the implantable device of FIG. 14;
- [0026]** FIG. 17 is a plan view of the implantable device of FIG. 14;
- [0027]** FIG. 18 is cross-sectional bottom elevational view of the implantable device of FIG. 14, cut along line 18-18 in FIG. 15; and
- [0028]** FIG. 19 is an exploded perspective view of the implantable device of FIG. 14.
- [0029]** FIG. 20 is a perspective view of one aspect of an implantable device for the fixation of spinous processes, shown in-situ between first and second spinous processes;

[0030] FIG. 21 is a perspective view of one aspect of the implantable device of FIG. 20;

[0031] FIG. 22 is an exploded perspective view of the implantable device of FIG. 20;

[0032] FIGs. 23A-23C are cross-sectional bottom elevational views of the implantable device of FIG. 20, showing the first plate and the second plates at various angles with respect to one another ;

[0033] FIGs. 24A and 24B are partially transparent top plan views of the implantable device of FIG. 20, showing the two plates having the ability to be connected at various connection points on the post and having the ability for polyaxial movement with respect thereto;

[0034] FIG. 25 is left side elevational view of one aspect of a first plate of the implantable device of FIG. 20;

[0035] FIG. 26 is a right side elevational view of one aspect of a first plate of the implantable device of FIG. 20, showing an implant positioned there between the first and second spaced plates;

[0036] FIG. 27 is a right side elevational view of one aspect of a second plate of the implantable device of FIG. 20;

[0037] FIG. 28 is a front cross-sectional elevational view of the implantable device of FIG. 20;

[0038] FIG. 29 an exploded perspective view of the implantable device of FIG. 20, showing the post positioned therethrough an implant;

[0039] FIG. 30 is an exploded perspective view of the implantable device of FIG. 20, showing the device without an implant;

[0040] FIG. 31 is an exploded perspective view of one aspect of an implantable device for the fixation of spinous processes, showing an embodiment wherein a first post is configured to be telescopingly received by an interior longitudinal cavity of a second post.

DESCRIPTION OF THE INVENTION

[0041] The present invention can be understood more readily by reference to the following detailed description, examples, and claims, and their previous and following description. Before the present system, devices, and/or methods are disclosed and described, it is to be understood that this invention is not limited to the

specific systems, devices, and/or methods disclosed unless otherwise specified, as such can, of course, vary. It is also to be understood that the terminology used herein is for the purpose of describing particular aspects only and is not intended to be limiting.

[0042] The following description of the invention is provided as an enabling teaching of the invention in its best, currently known aspect. Those skilled in the relevant art will recognize that many changes can be made to the aspects described, while still obtaining the beneficial results of the present invention. It will also be apparent that some of the desired benefits of the present invention can be obtained by selecting some of the features of the present invention without utilizing other features. Accordingly, those who work in the art will recognize that many modifications and adaptations to the present invention are possible and can even be desirable in certain circumstances and are a part of the present invention. Thus, the following description is provided as illustrative of the principles of the present invention and not in limitation thereof.

[0043] As used herein, the singular forms "a," "an" and "the" include plural referents unless the context clearly dictates otherwise. Thus, for example, reference to a "plate" includes aspects having two or more plates unless the context clearly indicates otherwise.

[0044] Ranges can be expressed herein as from "about" one particular value, and/or to "about" another particular value. When such a range is expressed, another aspect includes from the one particular value and/or to the other particular value. Similarly, when values are expressed as approximations, by use of the antecedent "about," it will be understood that the particular value forms another aspect. It will be further understood that the endpoints of each of the ranges are significant both in relation to the other endpoint, and independently of the other endpoint.

[0045] As used herein, the terms "optional" or "optionally" mean that the subsequently described event or circumstance may or may not occur, and that the description includes instances where said event or circumstance occurs and instances where it does not.

[0046] In one aspect, presented herein is an implantable device 10 for fixation of spinous processes. The device comprises first and second spaced plates 100, 200 configured for attachment to portions of adjacent spinous processes. In one aspect, each plate has a first and second surface, whereby the first surface 110 of the first plate 100 is configured to face the second surface 210 of the second plate 200.

[0047] In another aspect, the device comprises an implant 300 with a first face 310, an opposed second face 320, a top portion 330, and a bottom portion 340. The implant 300 is configured for insertion between two adjacent spinous processes. In one aspect, the implant is an interbody cage. When positioned, the first face 310 of the implant faces the first surface 110 of the first plate 100 and the second face 320 of the implant faces the second surface of the second plate 200. In this aspect, the first plate is connected to a portion of the implant substantially adjacent the first face, and the second plate is connected to a portion of the implant 300 substantially adjacent the second face.

[0048] It is beneficial for the plates to be able to move with respect to the implant in order to adjust to the contour of the portions of the spinous processes onto which they attach. In one aspect, the plates can move polyaxially with respect to the implant. In another aspect, one or both of the first and second plates are pivotally connected to the respective portions of the implant. As such, there exist several options to accomplish this feature.

[0049] In one aspect, the implant comprises a first post 120 projecting therefrom the first face and a second post 220 projecting therefrom the second face. As illustrated in Fig. 7, in one aspect, the first and second posts are substantially normal to the respective first and second faces. However, it is contemplated that the first and second post can be positioned at an acute angle relative to the respective first and second faces of the implant 300.

[0050] In another aspect, the first plate comprises a first socket 130 for complimentary receipt of the first post 120 and the second plate 200 comprises a second socket 230 for complimentary receipt of the second post 220. In this aspect, a first internal collar 140 can be positioned within the first socket 130 and a second internal collar 240 can be positioned within the second socket 230. The collars, thus, can be configured to engage a portion of the respective first and second posts. In yet

another aspect, each internal collar can be configured to pivot within each respective socket, thereby permitting polyaxial movement of the first and second plates with respect to the implant. The collars can have an external diameter that is larger than the diameter of the socket, thereby resisting movement of the collars into or out of the socket. Additionally, the collars may comprise a slit, which can be compressed for insertion into each socket during manufacturing.

[0051] In one exemplified aspect, there can be set screws 150, 250 configured to interface with each collar to tighten the collars thereto the respective first and second posts. The collars are configured to interface at a desired connection point along the particular post with which it interfaces, thereby selectively controlling the distance between the first and second surface of the first and second plates, respectively.

[0052] In another aspect, in lieu of, or in addition to, the polyaxial movement permitted by the collar and socket combination, the posts may comprise flexible material, thereby permitting polyaxial movement of the first and second plates with respect to the implant. As such, the plates can be connected thereto the posts without the use of collars, as shown in FIGs. 14-19.

[0053] In another exemplified aspect, as shown in FIG. 13, the posts can project therefrom the first and second surfaces of the first and second plates, respectively, rather than from the first and second faces 310, 320 of the implant. As such, in one aspect, the first and second posts are substantially normal to the respective first and second surfaces. In this aspect, the implant comprises a first socket for complimentary receipt of the first post and a second socket 230 for complimentary receipt of the second post.

[0054] Similar to the aspect described above, in another aspect, a first internal collar 140 is positioned within the first socket 130 and a second internal collar 240 is positioned within the second socket. The first and second collars are configured to engage a portion of the respective first and second posts 120, 220. In one aspect, they can engage the posts along the length of the post, thereby allowing for variance in the distance between the two plates.

[0055] In one exemplified aspect, each internal collar can pivot within each respective socket, thereby permitting polyaxial movement of the first and second plates with respect to the implant 300. Additionally, as mentioned herein, in another aspect, the first post and the second post are flexible, thereby permitting polyaxial movement of the first and second plates with respect to the implant.

[0056] At least one of the first and second surfaces 110, 210 of the plates 100, 200, in one aspect, comprises teeth 160, 260 for frictional engagement of spinous processes. As can be appreciated, both the first and second surfaces can comprise teeth. The teeth 160, 260, for example, engage the spinous processes when the plates are clamped thereon.

[0057] In another exemplified aspect, the top portion 330 of the implant defines a longitudinal trough 350 configured for complimentary receipt of a portion of a first spinous process 400. As can be appreciated by one skilled in the relevant art, the bottom portion 340 of the implant may likewise define a longitudinal trough 350 configured for complimentary receipt of a second spinous process 410, which would be adjacent the first spinous process 400.

[0058] The longitudinal trough of the top portion can also comprise external edges that have a plurality of consecutive ridges 360 configured for frictional engagement with a portion of the first spinous process. As can be appreciated, the longitudinal trough of the bottom portion may also have external edges with pluralities of consecutive ridges 360 for frictional engagement with a portion of the second spinous process 410. For ease of insertion, the implant can also comprise a tapered distal nose, as illustrated in FIG. 7.

[0059] As can be appreciated by one skilled in the art, at times, it can be beneficial to have, in addition to the mechanical fixation, a fusion or other bonding component of the implantable device explained herein. In one exemplified aspect, the implant 300 defines an internal cavity 370 in communication with at least one of the top portion and the bottom portion. In another aspect, the internal cavity 370 is in communication with both the top portion and the bottom portion. In use, the professional may introduce bone cement or bone graft material into the internal cavity to assist in fusion or bonding of the implant with the surrounding spinous processes.

[0060] In addition to the implantable device described herein, presented herein is a method of fixation of spinous processes of a subject. The method comprises assembling the components of the implantable device into an implant assembly (*i.e.* the first and second plates, and the implant), exposing at least one desired spinous process, inserting the implant 300 between two adjacent spinous processes, joining the first and second plates to the implant with a portion of the spinous processes being positioned therebetween, compressing the plates onto the first and second spinous processes, and maintaining the compression of the plates while affixing the plates with respect to the implant.

[0061] As mentioned herein, the implant can comprise a first and second post extended therefrom the first and second faces of the implant 300, each post configured for engagement with the first and second plates. In this aspect, the step of joining the first and second plates with the implant can comprise sliding the first plate 100 onto the first post 120 and the second plate 200 onto the second post whereby portions of the first and second spinous processes are positioned in a space between the first and second surfaces and affixing the first plate to the first post and the second plate to the second post. Where the first and second plates comprise collars with set screws, affixing the first and second plates onto the first and second posts can comprise merely tightening the set screws.

[0062] In one aspect of the method, the method comprises the step of angulating one or both of the first and second plates relative to each other in at least one plane during compression on the spinous process. In another aspect, the method comprises angulating the two plates in two planes during compression of the plates onto the spinous processes. In an exemplified aspect, the two planes are the coronal and axial planes.

[0063] As described, in one aspect, the implant defines an internal cavity in communication with its top and bottom portions. In another aspect, the method further comprises introducing bone graft material into the internal cavity, where the material is selected from the group consisting of autologous bone, allograft bone, bone substitute, and osteoinductive agent. In still another aspect, the method comprises introducing bone cement into the internal cavity.

[0064] In yet another exemplified aspect, the implantable device can comprise two spaced plates connected via a single post 520. In this aspect, an implant may or may not be present. In one aspect, the implantable device comprises first and second spaced plates 100, 200, the first plate 100 having a first surface 110 facing a second surface 210 of the second plate 200. In this aspect, the post 520 is connectable to the first and second plates. The post, in this aspect, has a first end portion 522, a second end portion 524, and a middle portion 526, where the first plate 100 is configured to connect to the first end portion 522 of the post 520 and the second plate 200 is configured to connect to the second end portion 524 of the post.

[0065] As with other aspects disclosed herein, in one aspect, the implantable device is configured for polyaxial movement of the first and second plates with respect to at least portions of the post 520 when the first and second plates are connected to the post. As with the other aspects described herein, the first and/or second plate can be configured to pivotally connect to a portion of the respective end portion of the post. Additionally, as described above, the first and second plates can be configured to connect to the post at a first and second connection point 530, 532, respectively. The connection points can be adjustable to control the distance between the first and second surfaces. In this aspect, the polyaxial movement of the plates with respect to the post can be accomplished in the various manners described herein above.

[0066] In one aspect, an implant 300, such as the ones described herein, can be positioned therebetween the first and second spaced place. In this aspect, at least a portion of the post is configured to pass therethrough a portion of the implant. In this aspect, the implant defines an aperture 380 through which the post can pass. The implant may also define an internal cavity (graft window) 370 for introduction of bone cement or bone graft material into the internal cavity to assist in fusion or bonding of the implant with the surrounding spinous processes.

[0067] In this aspect, the implantable device leads to a method of fixation of spinous processes of a subject. In one aspect, the method comprises assembling components into the described implant assembly, exposing a desired spinous process, connecting the first plate 100 to a portion of the first end portion 522 of the post, inserting the middle portion 526 of the post between adjacent spinous processes to

position the post substantially between a first spinous process and a second spinous process, sliding the second plate 200 onto a portion of the second end portion 524 of the post 520 whereby portions of the first and second spinous processes are positioned in a space between the first and second surfaces, compressing the plates onto the first and second spinous processes; and maintaining compression of the plates onto the first and second spinous processes while affixing the first plate to the first end portion and the second plate to the second end portion.

[0068] This aspect of the method can also comprise angulating the first plate relative to the second plate in at least one plane during compression of the plates on the spinous processes. In an exemplified aspect, the step of angulating the first plate relative to the second plate comprises angulating the two plates in two planes during compression of the plates onto the spinous processes. In another aspect, the angulation of the first plate relative to the second plate is in coronal and axial planes. The method can also comprise means for pivotally connecting the first and second end portions, respectively.

[0069] In still another aspect, the implantable device can comprise the first and second spaced plates 100, 200 with a first post 120 having a first end 122 pivotally connected to the first surface 110 of the first plate 100 and a second end 124 spaced therefrom the first surface, as well as a second post 220 having a second end 222 pivotally connected to the second surface 210 of the second plate 200 and a first end 224 spaced therefrom the second surface. In this aspect, the second post is at least partially tubular, defining an interior longitudinal cavity 226. Additionally, in this aspect, at least a portion of the first post is configured to be telescopingly received by the interior longitudinal cavity. The position of the first post relative to the second post can be fixed using a set screw 228 positioned through a portion of the second post configured to engage the first post and maintain its position. The position may also be fixed using a collar or band around a portion of the second post that tightens in any known fashion. The second post may also be crimped onto the first post. Other known fixation means can also be employed.

[0070] As with the various aspects described herein, an implant can be positioned therebetween the first and second spaced plates. In this aspect, at least a portion of at least one of the first and second posts is configured to pass therethrough a portion of the implant.

[0071] In one exemplified aspect, the first plate 100 comprises a first socket 130 for complimentary receipt of the first end 122 of the first post 120, and the second plate 200 comprises a second socket 230 for complimentary receipt of the second end 222 of the second post 220. As with the other aspects described herein, there can be a first internal collar 140 within the first socket and a second internal collar 240 within the second socket. As such, the first collar is configured to engage a portion of the first end of the first post and the second collar is configured to engage a portion of the second end of the second post. In one aspect, each internal collar is configured to pivot within each respective socket, thereby permitting the polyaxial movement of the first and second plates with respect to the first and second posts, respectively. A first set screw can also be configured to interface with the first collar, and a second set screw can be configured to interface with the second collar to tighten the collars thereto the respective first and second posts.

[0072] As an alternative to the internal collars used for polyaxial movement, or in addition thereto, in one aspect, the first and second posts can be substantially flexible, thereby permitting the polyaxial movement of the first and second plates with respect to the respective first and second post.

[0073] Although several aspects of the invention have been disclosed in the foregoing specification, it is understood by those skilled in the art that many modifications and other aspects of the invention will come to mind to which the invention pertains, having the benefit of the teaching presented in the foregoing description and associated drawings. It is thus understood that the invention is not limited to the specific aspects disclosed hereinabove, and that many modifications and other aspects are intended to be included within the scope of the appended claims. Moreover, although specific terms are employed herein, as well as in the claims that follow, they are used only in a generic and descriptive sense, and not for the purposes of limiting the described invention.

Claims

What is claimed is:

1. An implantable device for fixation of spinous processes, comprising:
first and second spaced plates, the first plate having a first surface facing a second surface of the second plate; and
a post having a first end portion, a second end portion, and a middle portion, wherein the first plate is configured to connect to the first end portion of the post and the second plate is configured to connect to the second end portion of the post; wherein the implantable device is configured for polyaxial movement of the first and second plates with respect to at least portions of the post when the first and second plates are connected to the post.
2. The implantable device of claim 1, further comprising an implant positioned therebetween the first and second spaced plates, wherein at least a portion of the post is configured to pass therethrough a portion of the implant.
3. The implantable device of claim 1, wherein the first plate is configured to pivotally connect to a portion of the first end portion of the post.
4. The implantable device of claim 3, wherein the second plate is configured to pivotally connect to a portion of the second end portion of the post.
5. The implantable device of claim 1, wherein the first plate and second plate are configured to connect to the post at a first and second connection point, respectively, and wherein the first and second connection points are adjustable to selectively control the distance between the first and second surfaces.
6. The implantable device of claim 1, wherein the first plate comprises a first socket for complimentary receipt of the first end portion of the post and wherein the second plate comprises a second socket for complimentary receipt of the second end portion of the post.
7. The implantable device of claim 6, further comprising a first internal collar within the first socket and a second internal collar within the second socket, wherein the first collar is configured to engage a portion of the first end portion of the post and

the second collar is configured to engage a portion of the second end portion of the post.

8. The implantable device of claim 7, wherein each internal collar is configured to pivot within each respective socket, thereby permitting the polyaxial movement of the first and second plates with respect to the implant.

9. The implantable device of claim 8, further comprising a first set screw configured to interface with the first collar, and a second set screw configured to interface with the second collar to tighten the collars thereto the respective first and second end portions.

10. The implantable device of claim 1, wherein the post is substantially flexible, thereby permitting the polyaxial movement of the first and second plates with respect to the middle portion of the post.

11. The implantable device of claim 1 wherein at least one of the first and second surfaces comprises teeth for frictional engagement of spinous processes.

12. An implantable device for fixation of spinous processes, comprising:
first and second spaced plates, the first plate having a first surface facing a second surface of the second plate; and
a post having a first end portion, a second end portion, and a middle portion, wherein the first plate is connected to the first end portion of the post and the second plate is connected to the second end portion of the post;
wherein the implantable device is configured for polyaxial movement of the first and second plates with respect to at least portions of the post.

13. The implantable device of claim 12, further comprising an implant positioned therebetween the first and second spaced plates, wherein at least a portion of the post passes therethrough a portion of the implant.

14. The implantable device of claim 12, wherein the first plate is pivotally connected to a portion of the first end portion of the post.

15. The implantable device of claim 14, wherein the second plate is pivotally connected to a portion of the second end portion of the post.

16. The implantable device of claim 12, wherein the first plate and second plates are connected to the post at a first and second connection point, respectively.
17. The implantable device of claim 16, wherein the first and second connection points are adjustable to selectively control the distance between the first and second surfaces.
18. The implantable device of claim 12, wherein the post is substantially flexible, thereby permitting the polyaxial movement of the first and second plates with respect to the middle portion of the post.
19. A method of fixation of spinous processes of a subject comprising:
assembling components into an implant assembly comprising:
a first plate having a first surface and comprising a first socket;
a second plate having a second surface and comprising a second socket;
a post having a first end portion, a second end portion, and a middle portion;
exposing a desired spinous process;
connecting the first plate to a portion of the first end of the post;
inserting the middle portion of the post between adjacent spinous processes to position the post substantially between a first spinous process and a second spinous process;
sliding the second plate onto a portion of the second end portion of the post whereby portions of the first and second spinous processes are positioned in a space between the first and second surfaces;
compressing the plates onto the first and second spinous processes; and
maintaining compression of the plates onto the first and second spinous processes while affixing the first plate to the first end portion and the second plate to the second end portion.
20. The method of claim 19, further comprising:
angulating the first plate relative to the second plate in at least one plane during compression of the plates on the spinous processes.

21. The method of claim 20, further comprising:
angulating the first plate relative to the second plate in two planes during compression of the plates onto the spinous processes.
22. The method of claim 21, wherein angulation of the first plate relative to the second plate is in coronal and axial planes.
23. The method of claim 19, wherein the first plate and the second plate are pivotally connected to the first and second end portions, respectively.
24. An implantable device for fixation of spinous processes, comprising:
first and second spaced plates, the first plate having a first surface facing a second surface of the second plate;
a first post having a first end pivotally connected to the first surface and a second end spaced therefrom the first surface;
a second post having a second end pivotally connected to the second surface and a first end spaced therefrom the second surface;
wherein the first post is at least partially tubular, defining an interior longitudinal cavity, and wherein at least a portion of the second post is configured to be telescopingly received by the interior longitudinal cavity; and
means for fixing the position of the second post relative to the first post.
25. The implantable device of claim 24, further comprising an implant positioned therebetween the first and second spaced plates, wherein at least a portion of at least one of the first and second posts is configured to pass therethrough a portion of the implant.

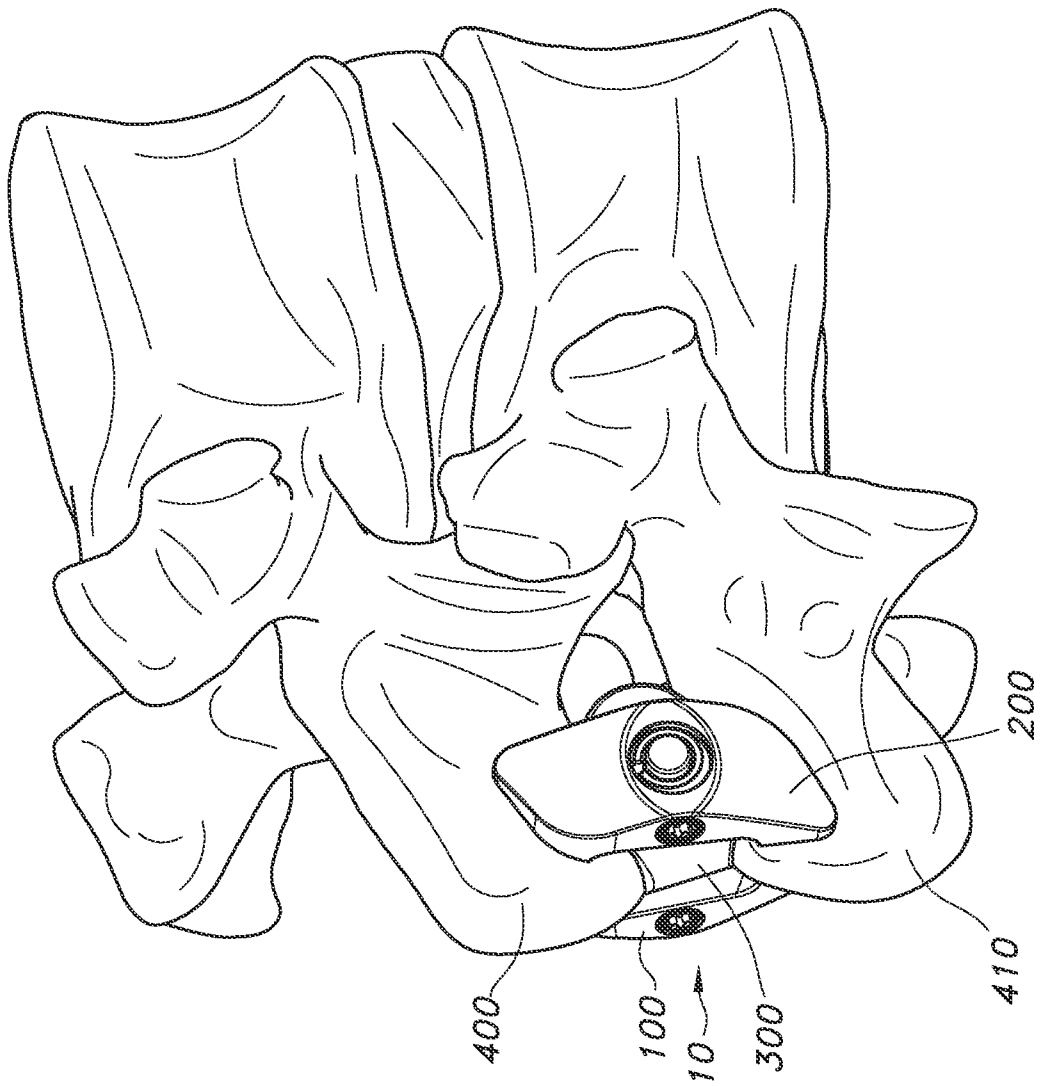


FIG. 1

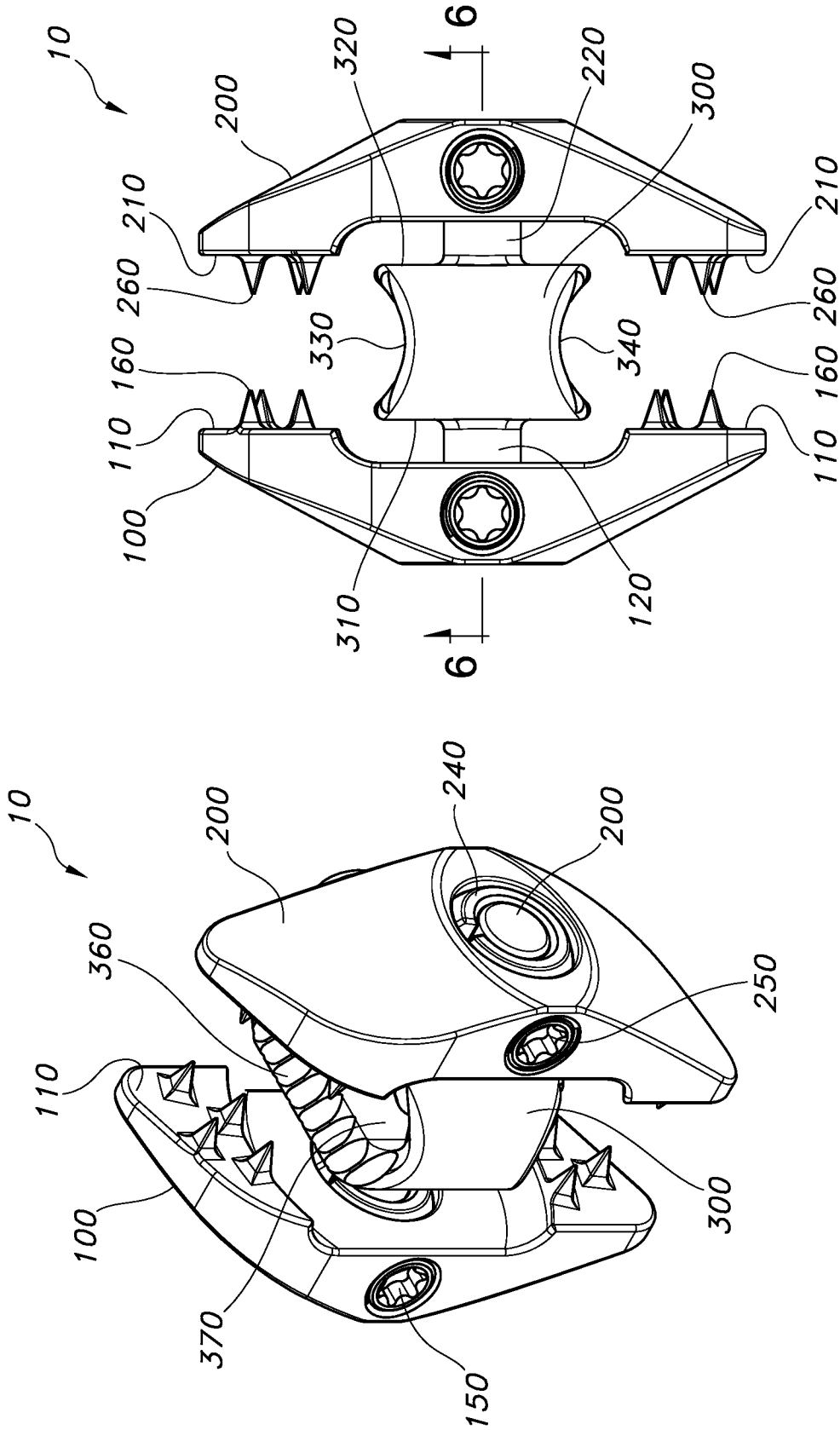


FIG. 3

FIG. 2

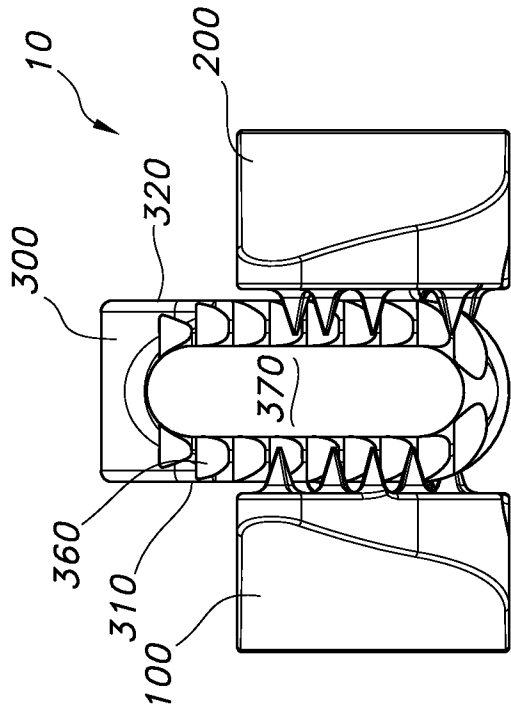


FIG. 5

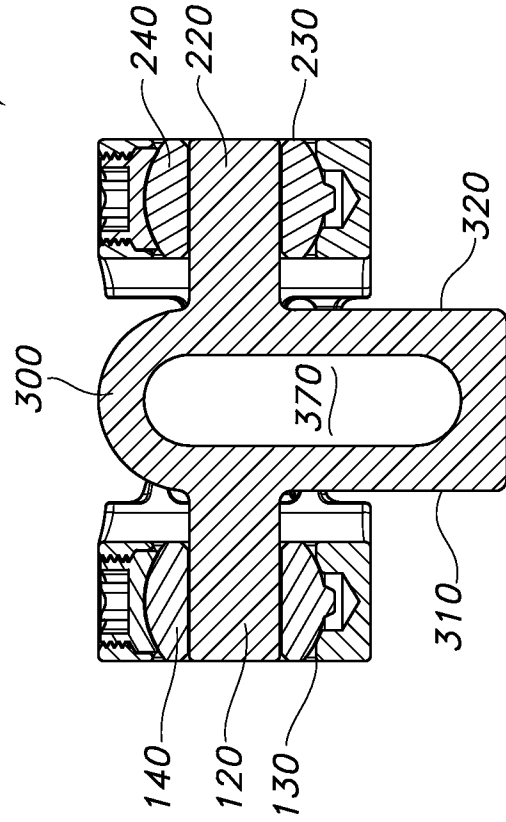


FIG. 6

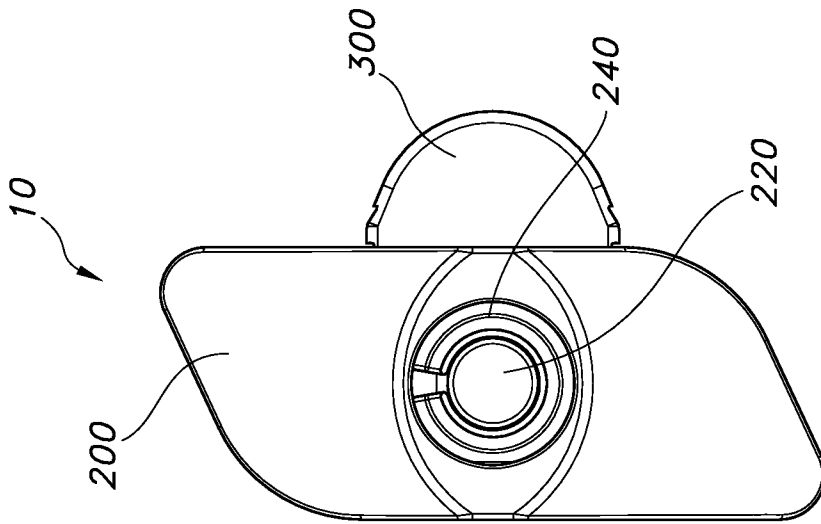


FIG. 4

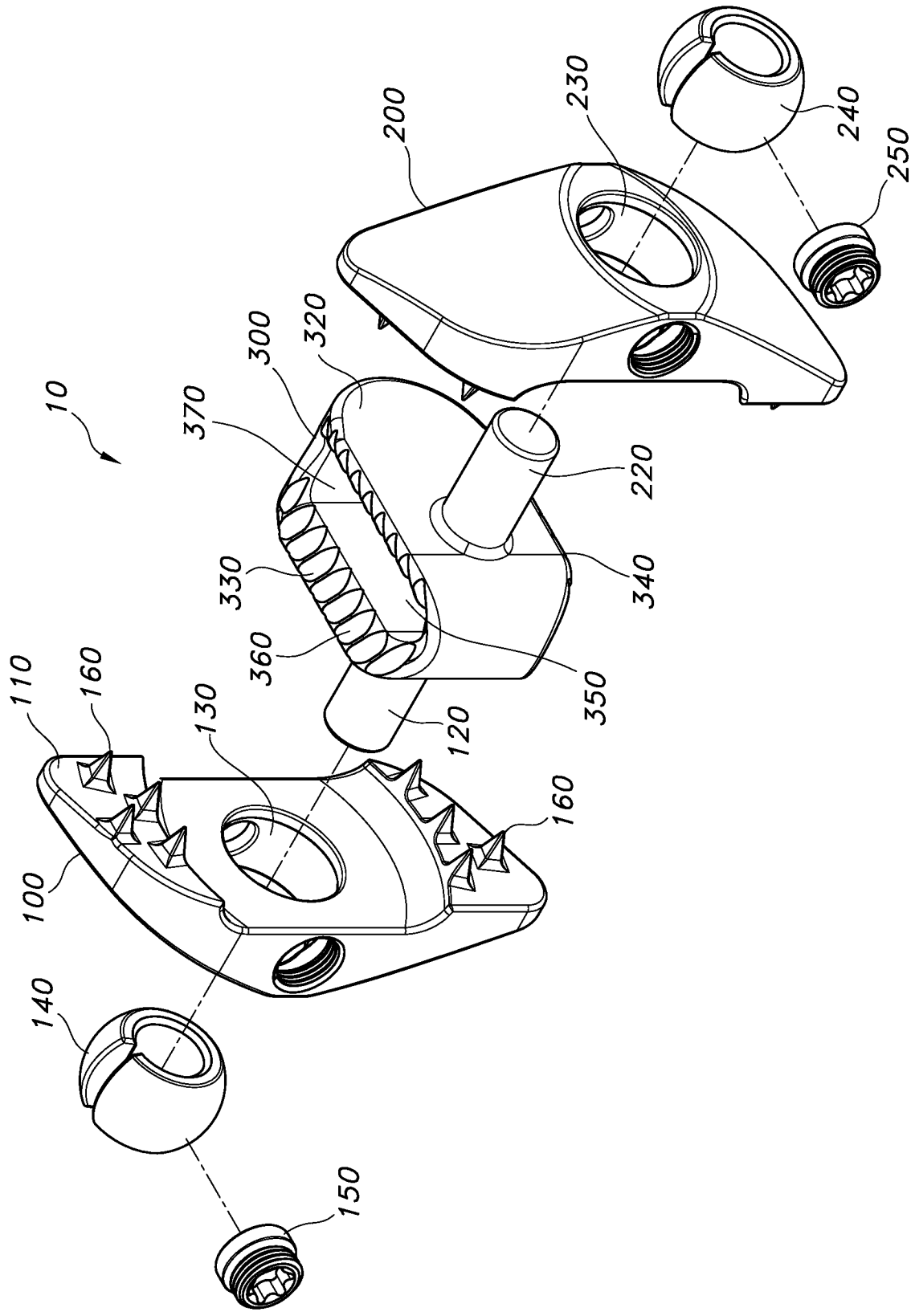


FIG. 7

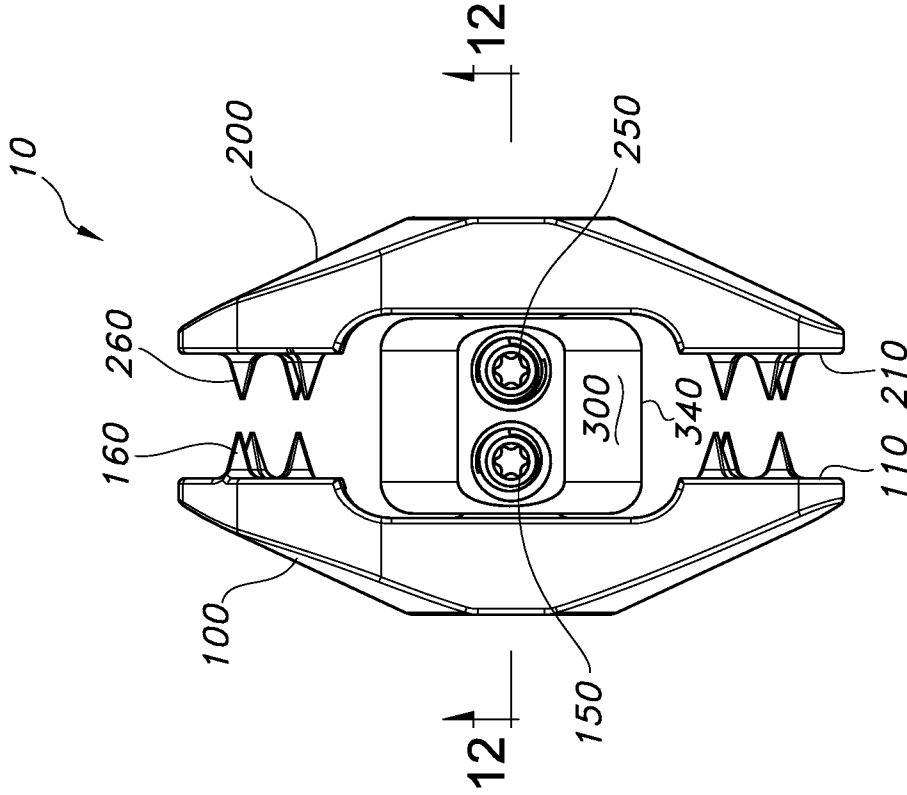


FIG. 9

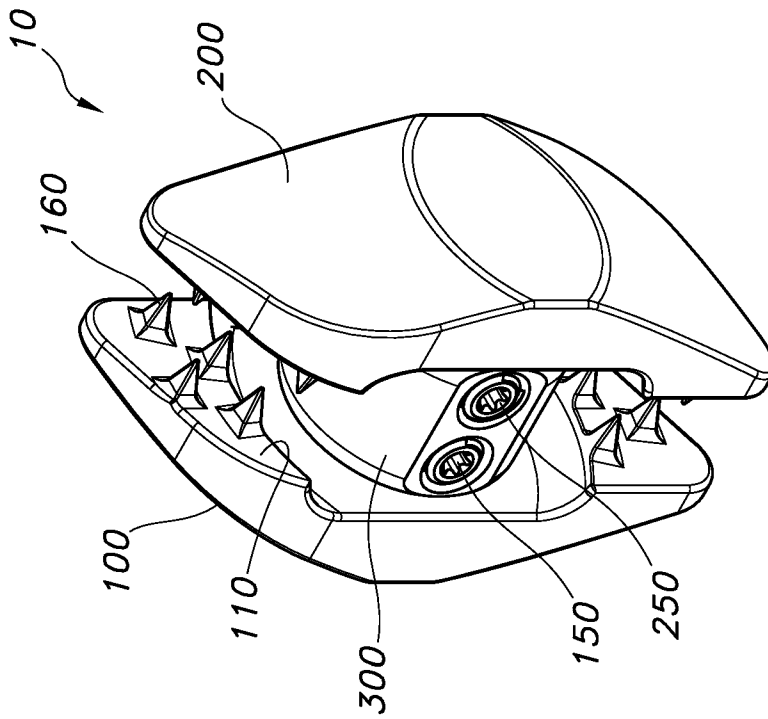


FIG. 8

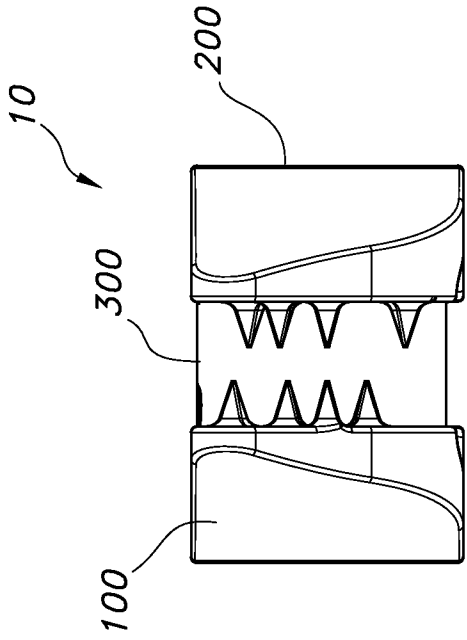


FIG. 11

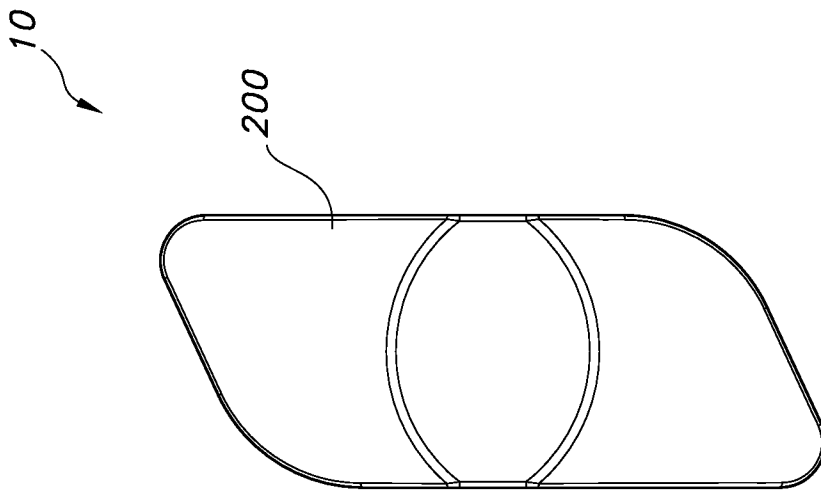


FIG. 10

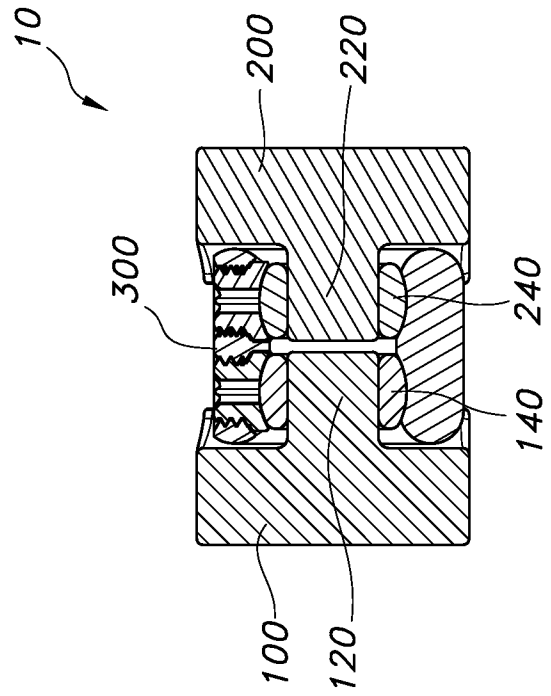


FIG. 12

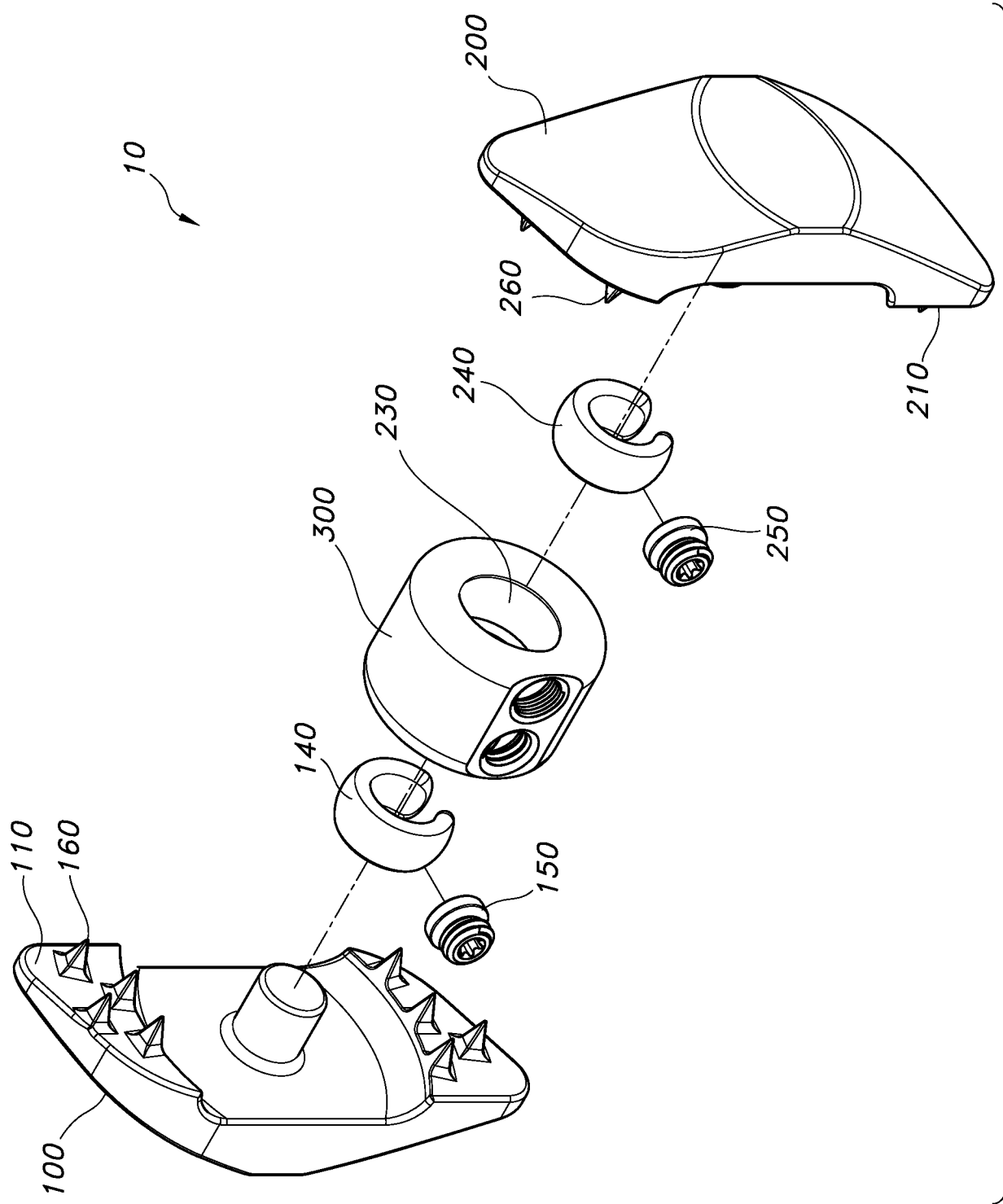


FIG. 13

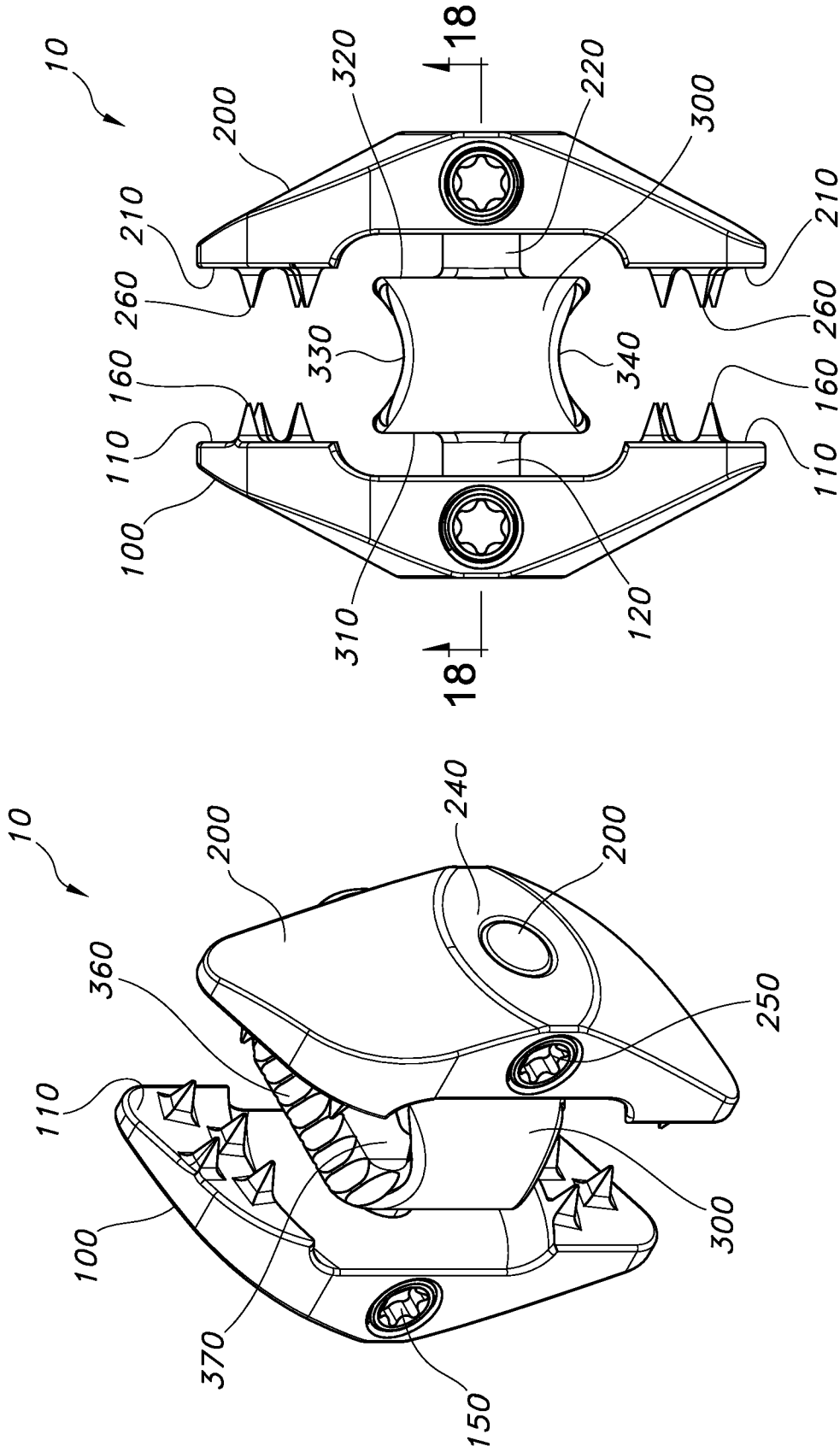


FIG. 15

FIG. 14

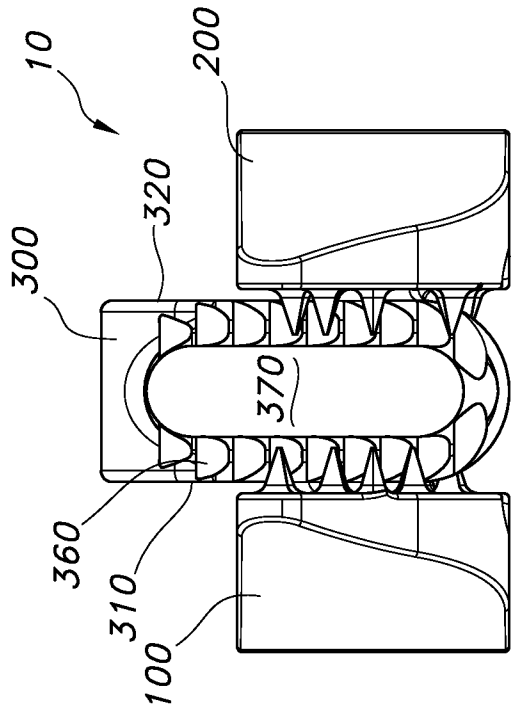


FIG. 17

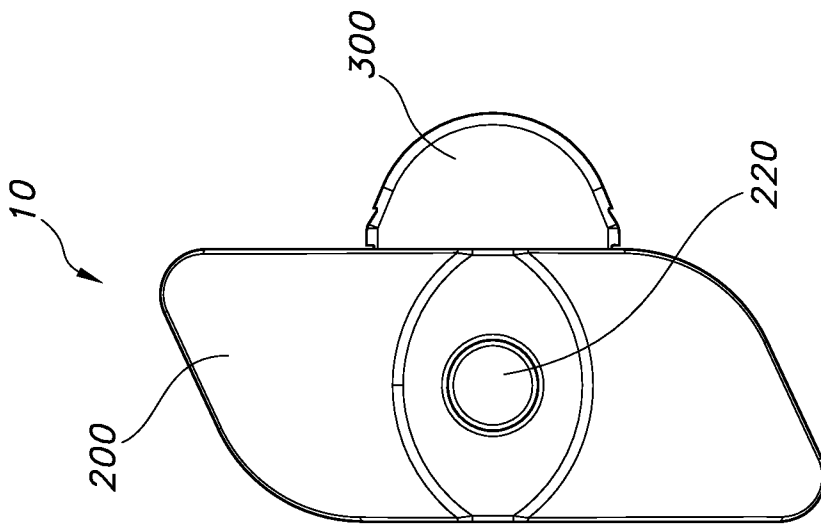


FIG. 16

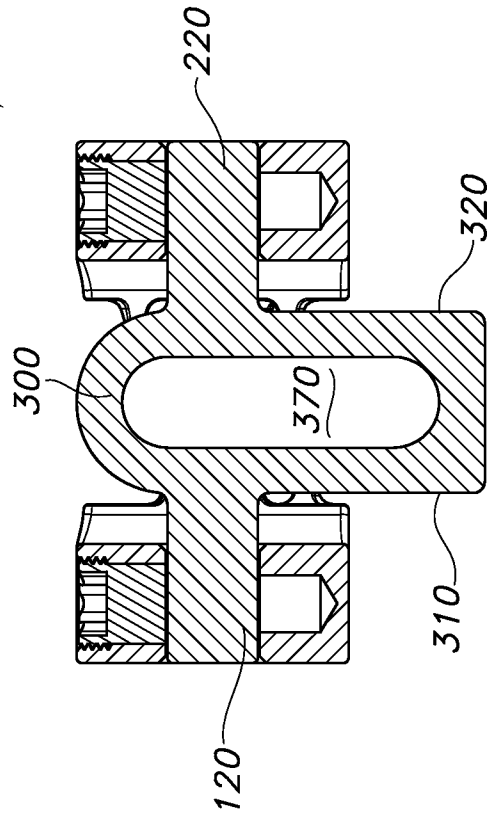


FIG. 18

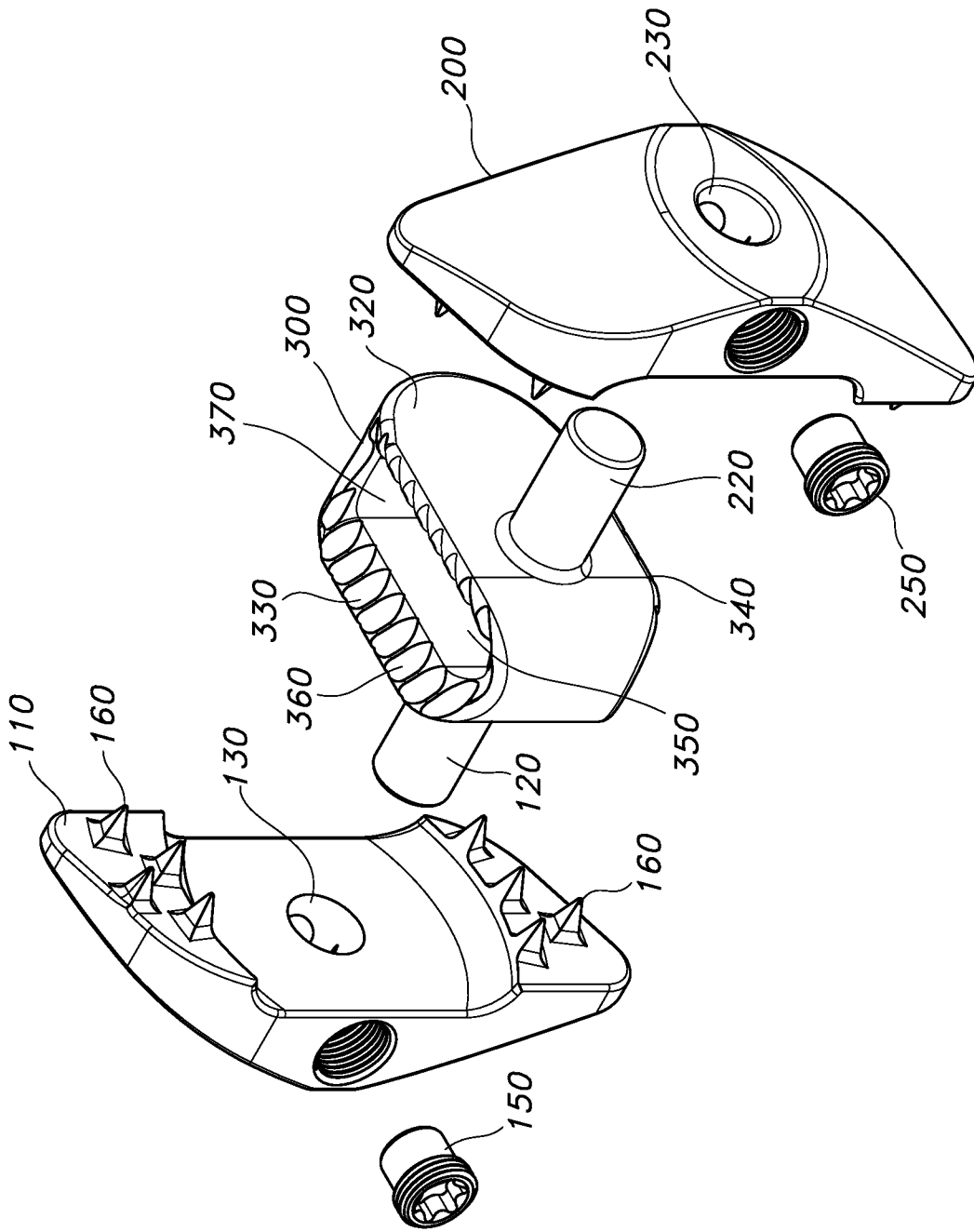


FIG. 19

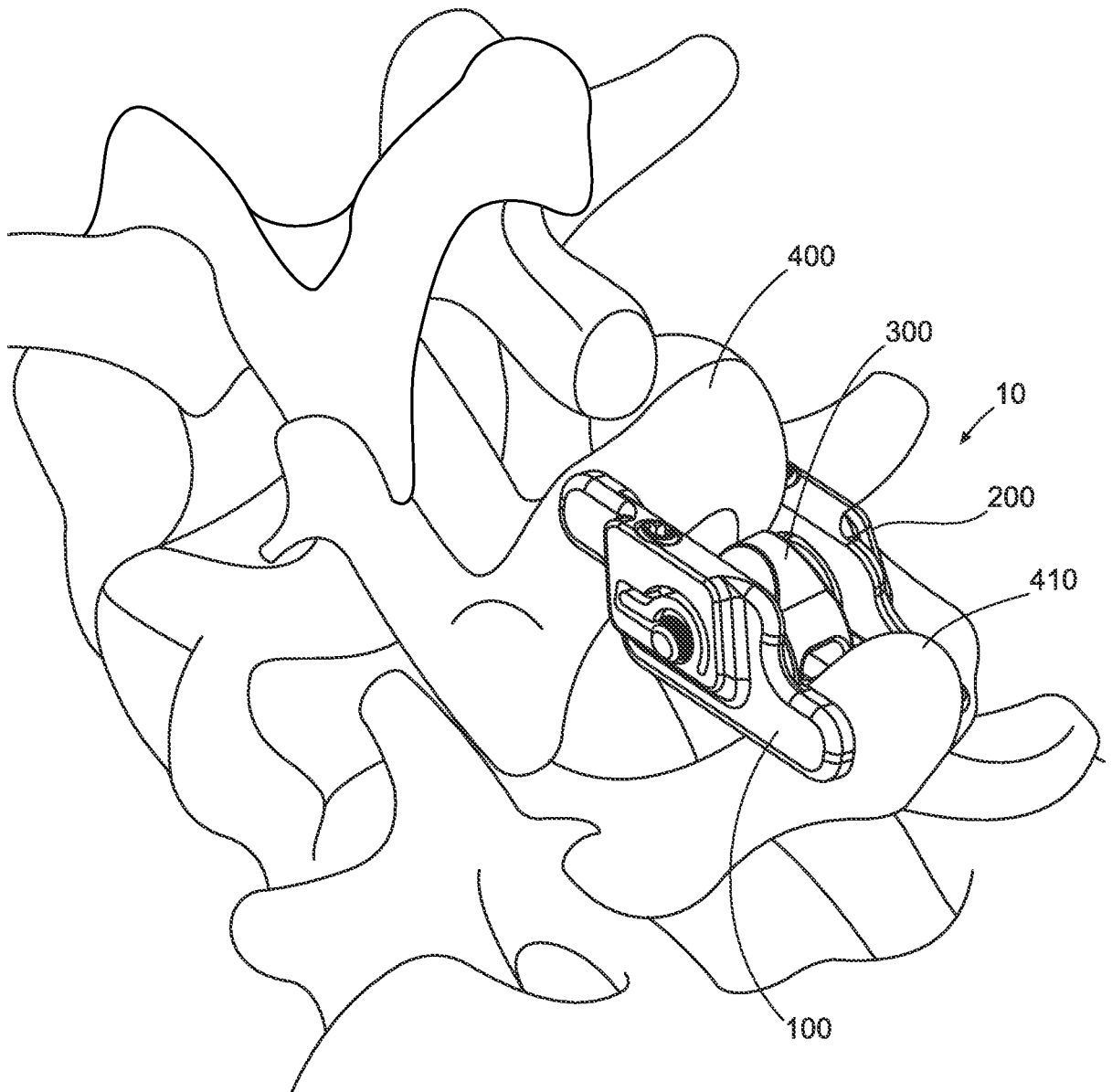


FIG. 20

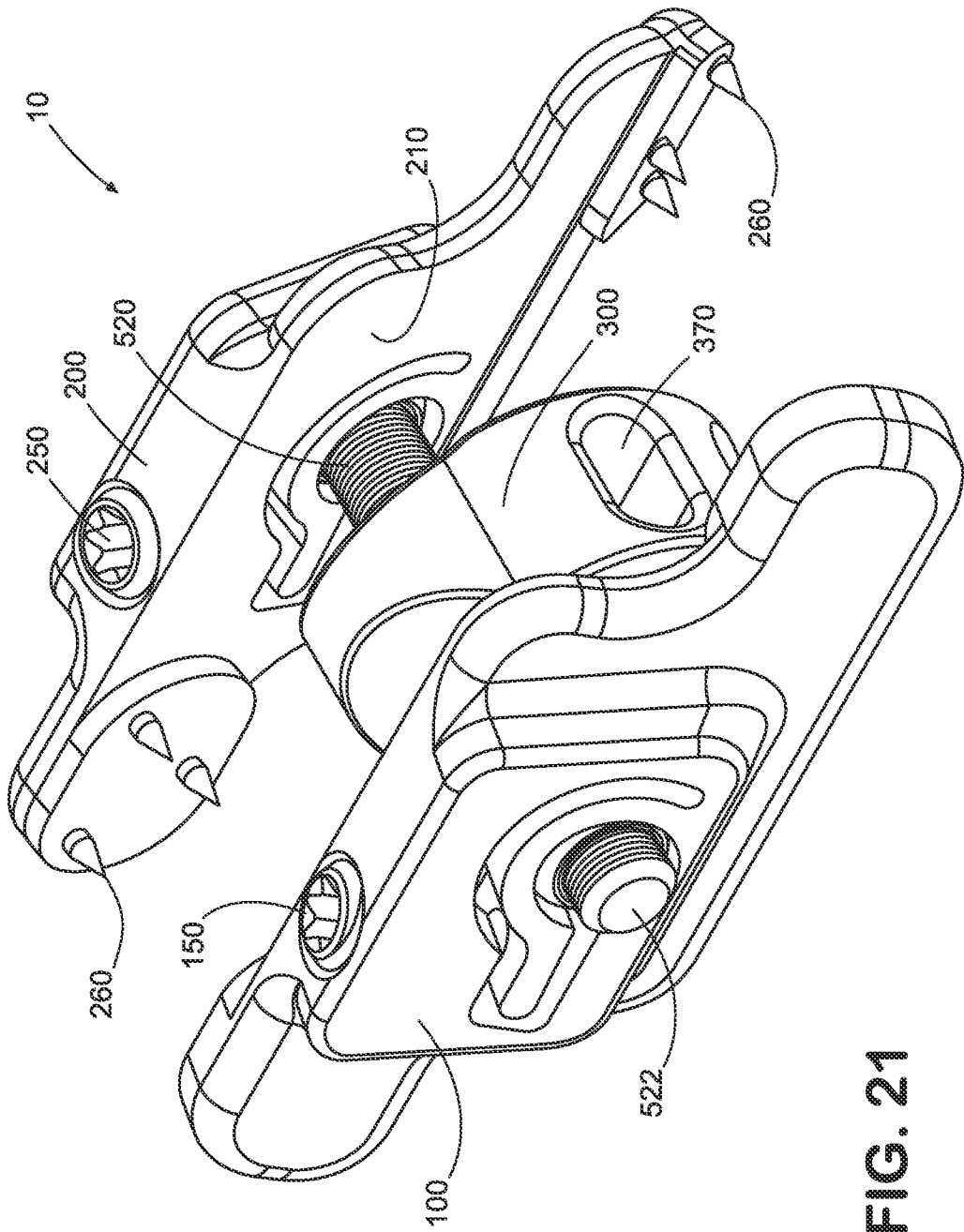


FIG. 21

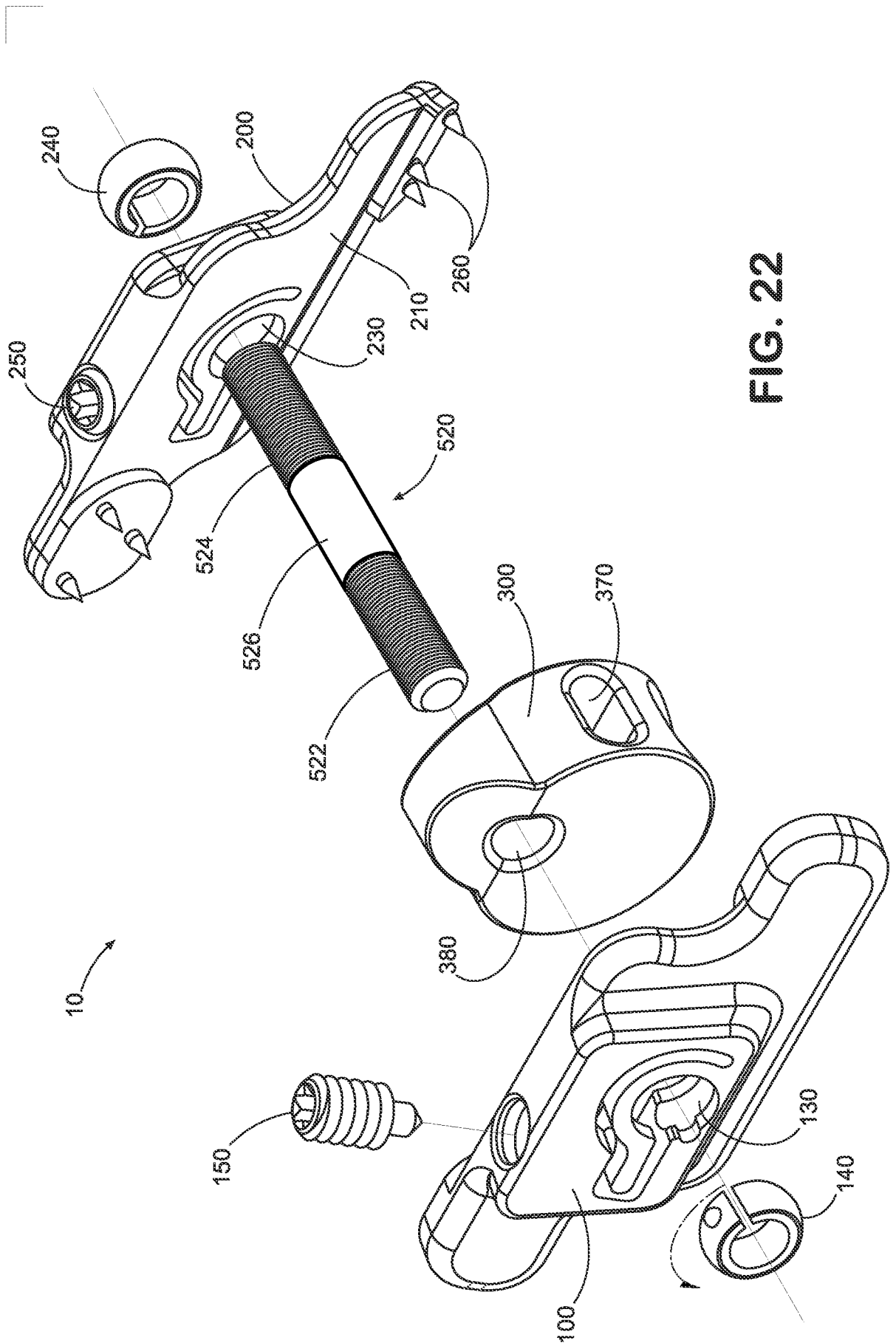


FIG. 22

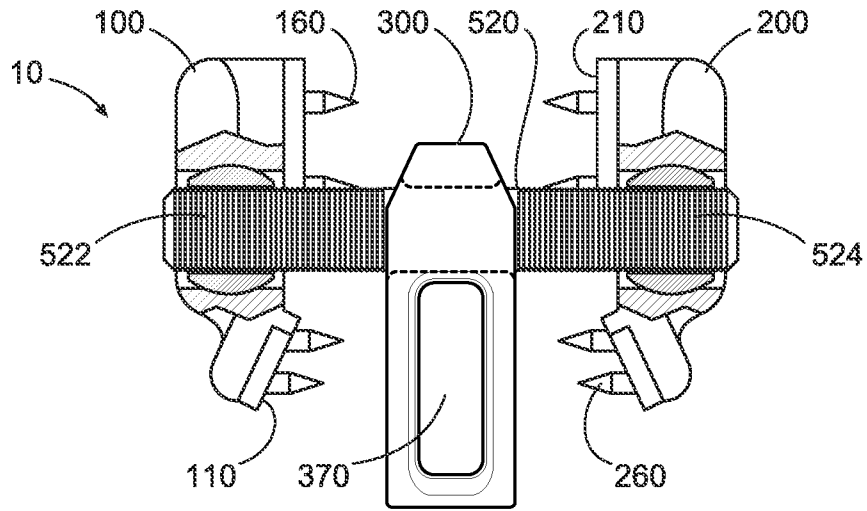


FIG. 23A

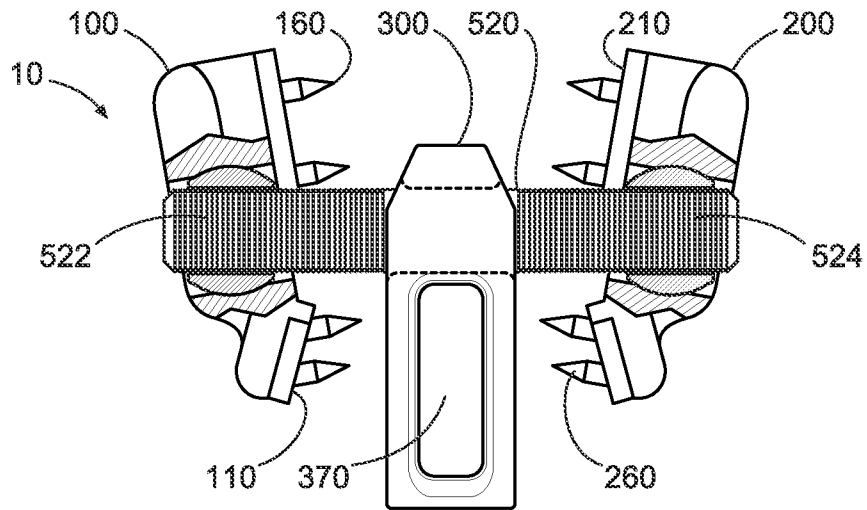


FIG. 23B

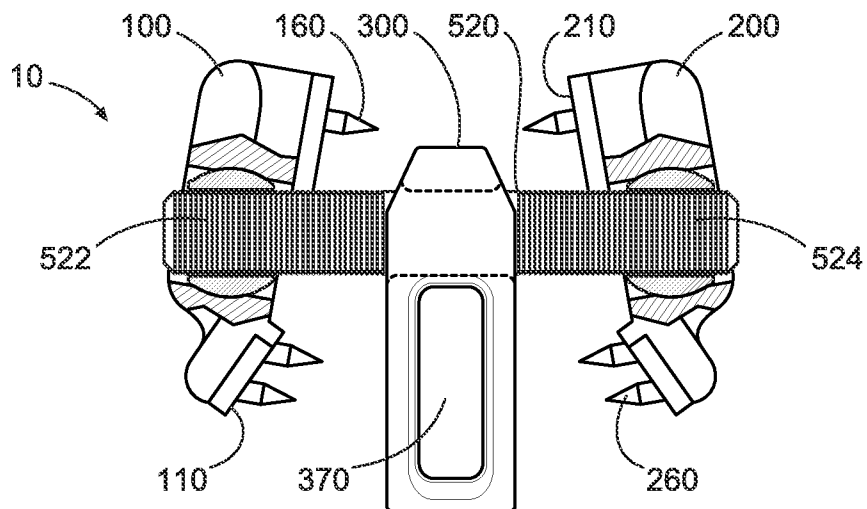


FIG. 23C

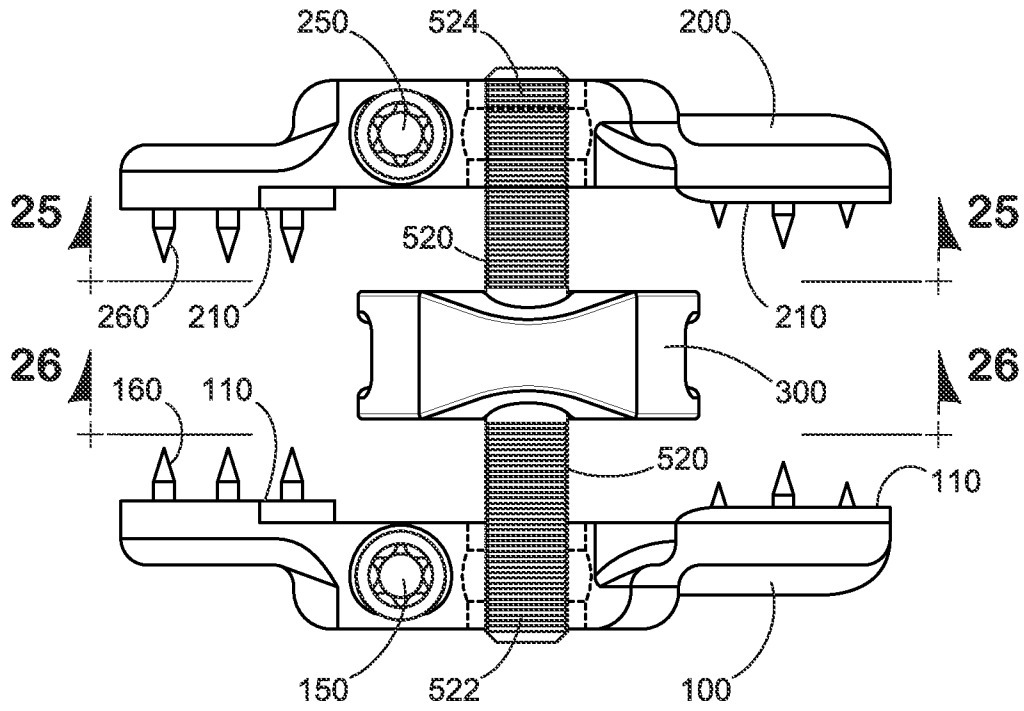


FIG. 24A

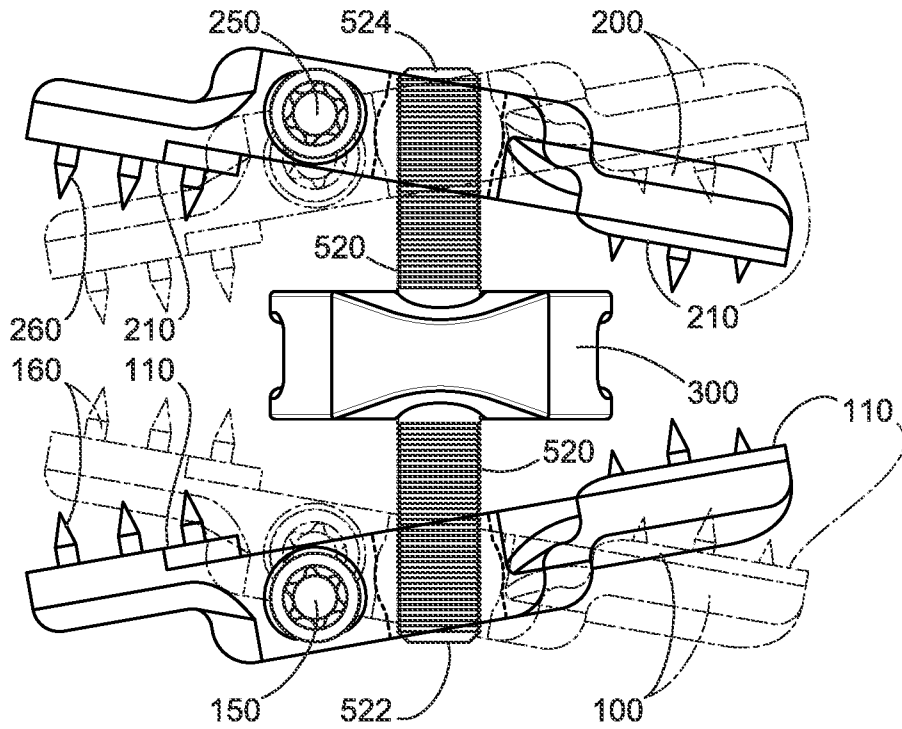


FIG. 24B

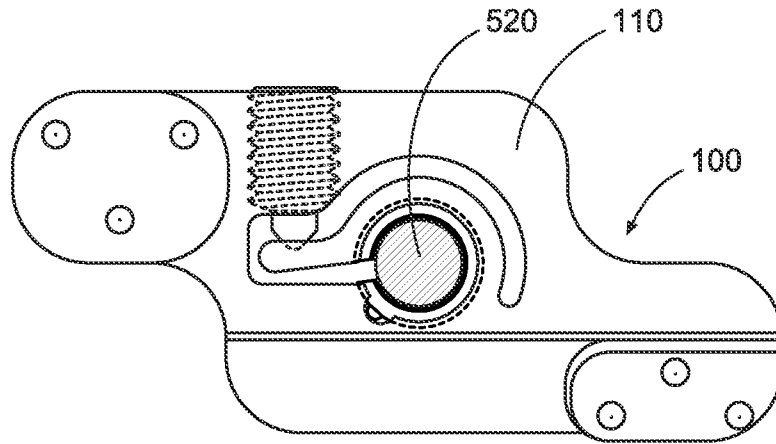


FIG. 25

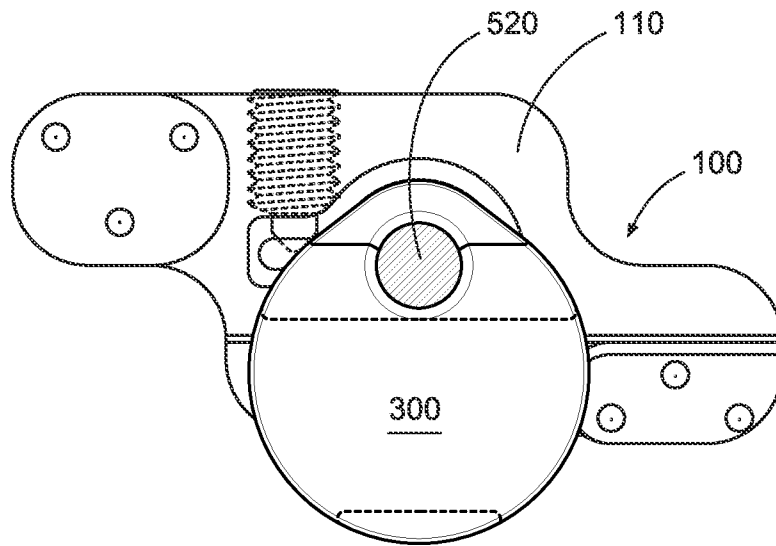


FIG. 26

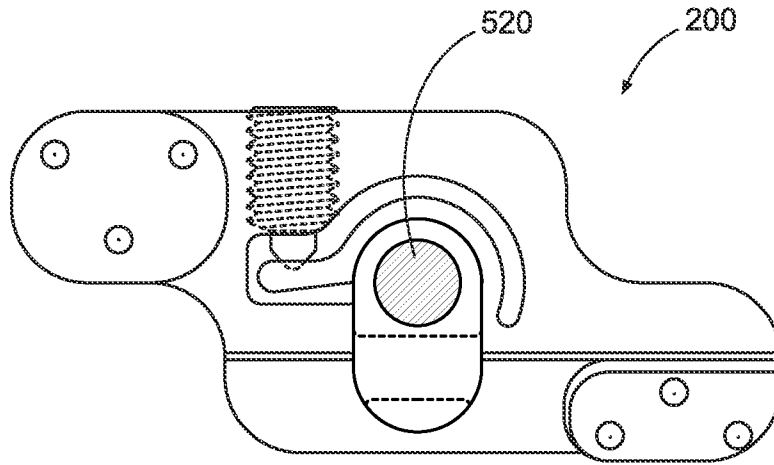


FIG. 27

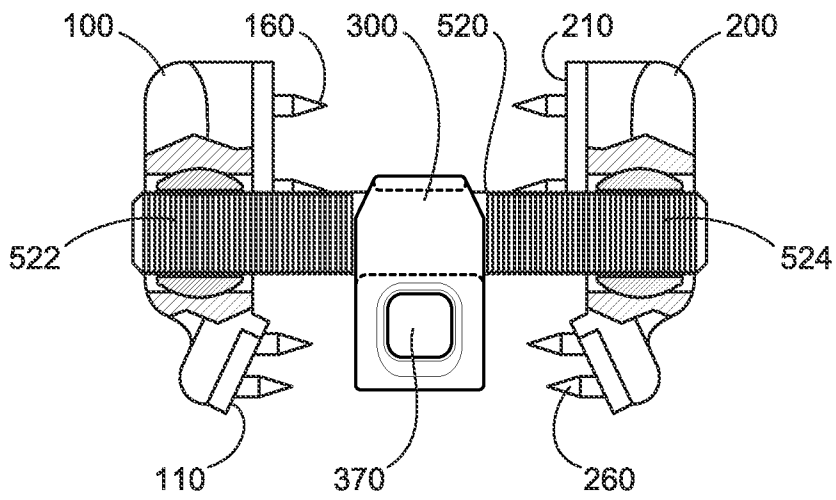


FIG. 28

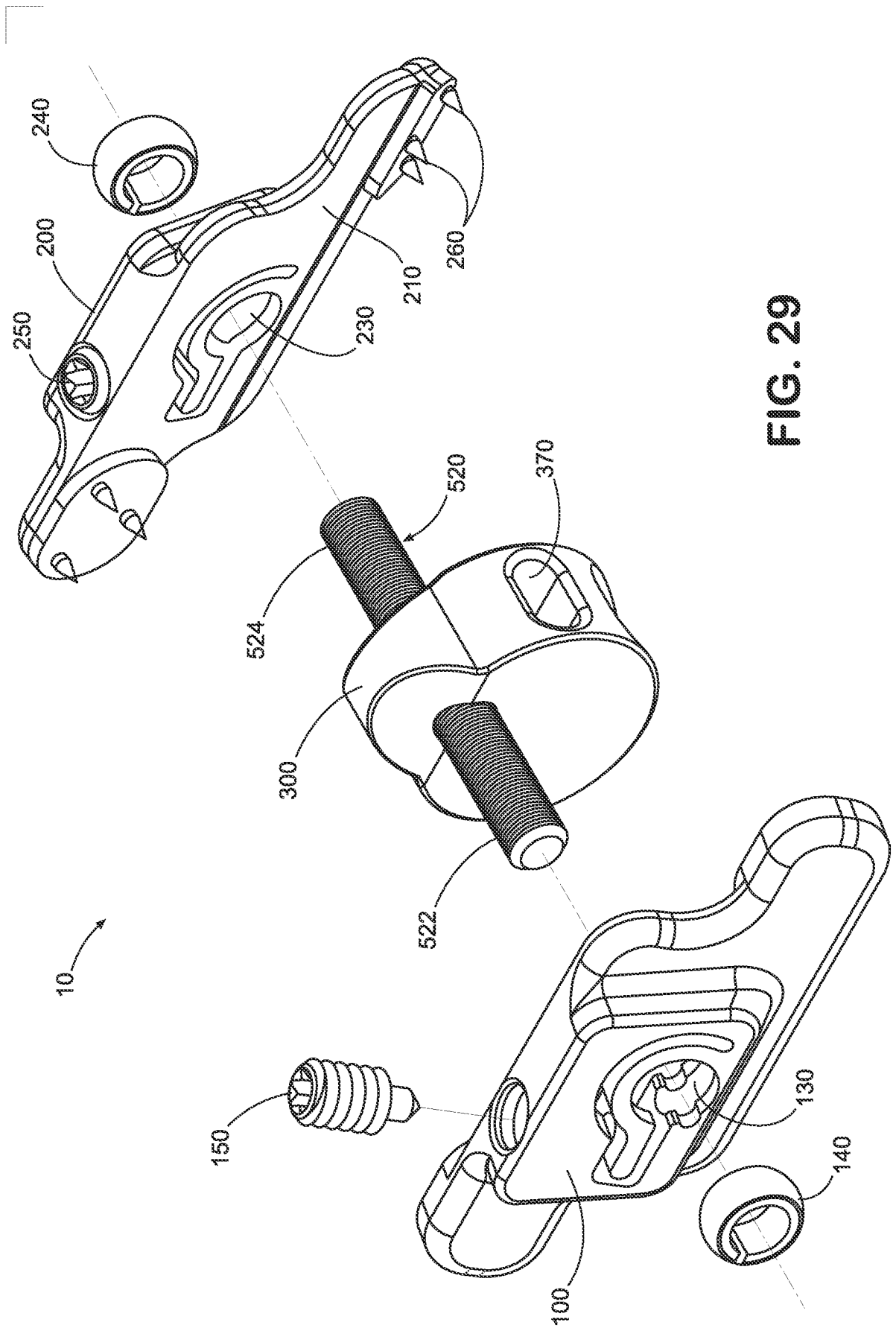


FIG. 29

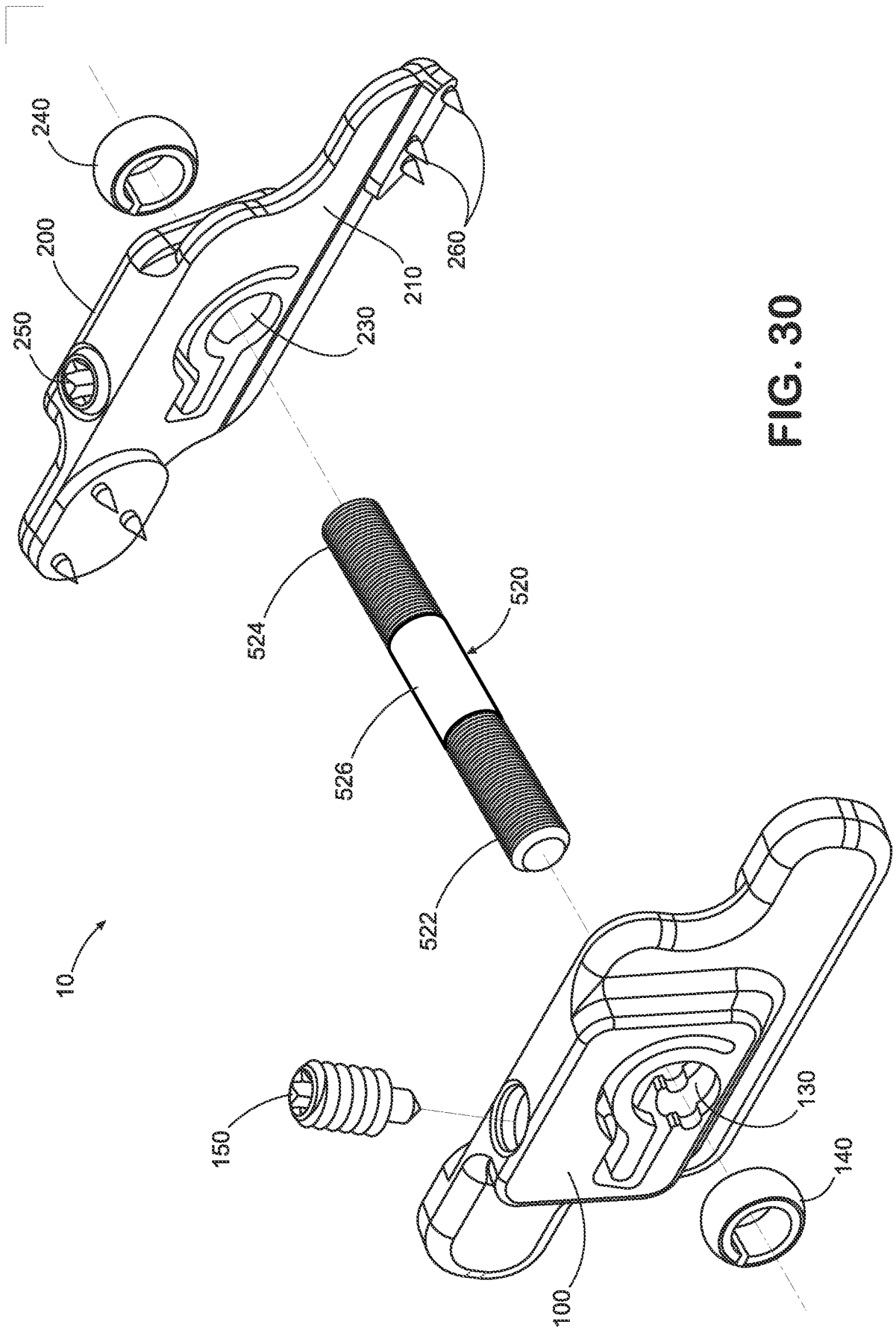


FIG. 30

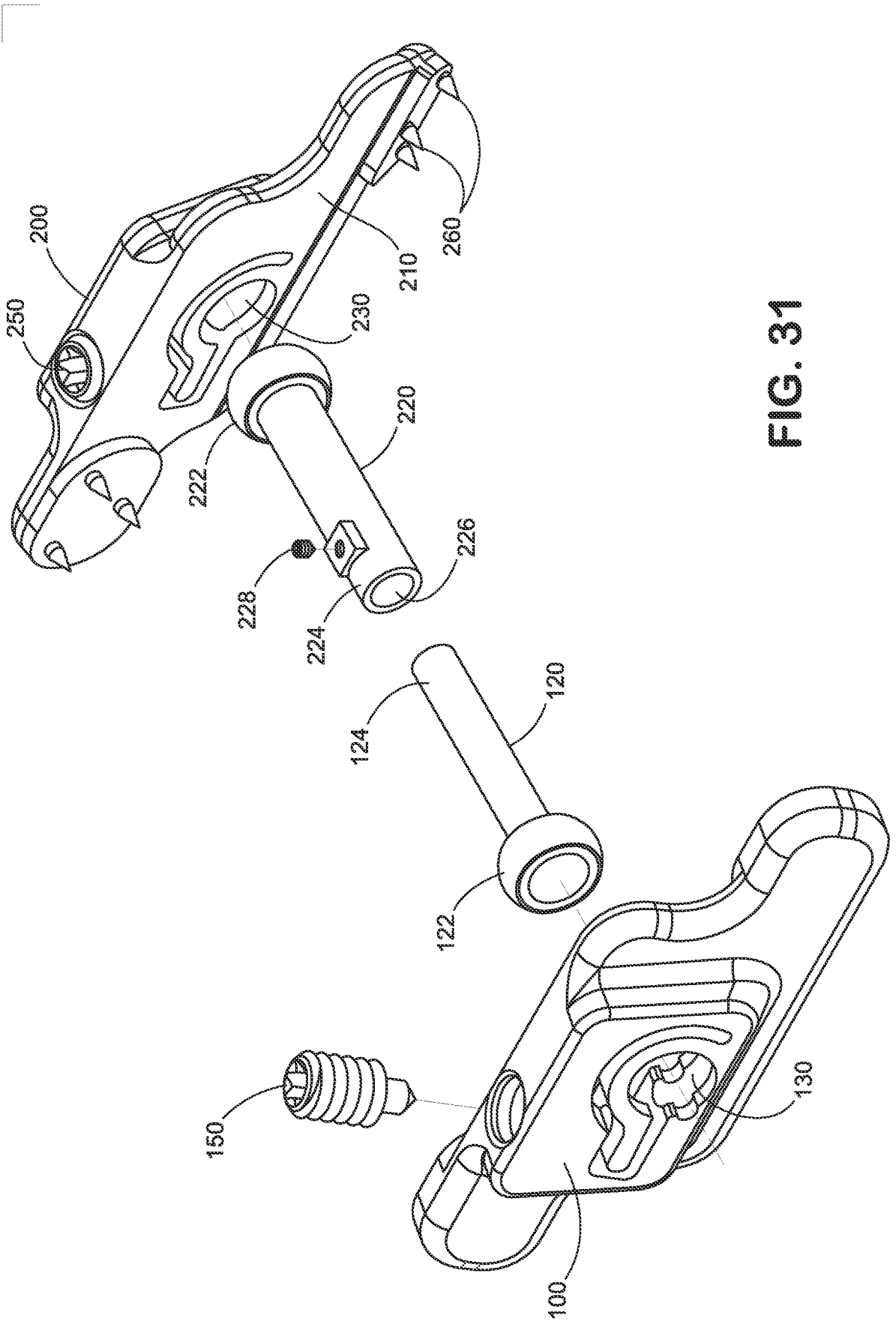


FIG. 31

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US13/37602

A. CLASSIFICATION OF SUBJECT MATTER IPC(8) - A61B 17/70 (2013.01) USPC - 606/60, 53, 286, 280, 246, 248 According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC(8) - A61B 17/70 (2013.01) USPC - 606/60, 53, 286, 280, 246, 248, 249, 279 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) MicroPatent (US-G, US-A, EP-A, EP-B, WO, JP-bib, DE-C,B, DE-A, DE-T, DE-U, GB-A, FR-A); DialogPRO; Google; Medline/PubMed: collar, pivot, plate, post, rotate, screw, spinal, spinous, twist		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 2011/0022090 A1 (GORDON, C, et al.) January 27, 2011; figures; paragraphs [0043], [0102], [0103], [0107], [0113], [0114], [0117], [0120]-[0123], [0133]-[0135]	19-22 ----- 1-18, 23
Y	US 2010/0036419 A1 (PATEL, N, et al.) February 11, 2010; figure 31-38; paragraph [0133], [0134]	1-18, 23
Y	US 2009/0264927 A1 (GINSBERG, HJ, et al.) October 22, 2009; figures 4, 7, 8; paragraph [00066], [0075]	8, 9
Y	US 2007/0118120 A1 (STEVENSON, K, et al.) May 24, 2007; figures 1, 2; paragraph [0049]	10, 18
Y	US 2008/0243185 A1 (FELIX, BA, et al.) October 2, 2008; figures 1, 2, 26, 27; paragraphs [0057]-[0059], [0071], [0144], [0157]	9
A	US 2003/0216736 A1 (ROBINSON, JC, et. al.) November 20, 2003; figures, paragraphs [0019]-[0029]	1-23
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/>		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family	
Date of the actual completion of the international search 03 September 2013 (03.09.2013)	Date of mailing of the international search report <div style="font-size: 2em; font-weight: bold; text-align: center;">09 SEP 2013</div>	
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Shane Thomas PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774	

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US13/37602

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Group I: Claims 1-23 are directed toward an implantable device for and a method of fixation of spinous processes, comprising: first and second plates; a post; first plate connected to first end of post; second plate connected to second end of post; wherein device is configured for polyaxial movement.

Group II: Claims 24-25 are directed toward are directed toward an implantable device for fixation of spinous processes, comprising: first and second plates; a first post; a second post; wherein the first post is at least partially tubular, defining an interior longitudinal cavity; wherein at least a portion of the second post is configured to be telescopically received by the interior longitudinal cavity; and means for fixing the position of the second post relative to the first post.

- Please See Next Supplemental Page -

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1-23

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US13/37602

-***- Continued from Box III - Observations where unity of invention is lacking -***-

The inventions listed as Groups I and II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical features of Group I include wherein the first plate is configured to connect to the first end portion of the post and the second plate is configured to connect to the second end portion of the post; wherein the implantable device is configured for polyaxial movement of the first and second plates with respect to at least portions of the post when the first and second plates are connected to the post; assembling components into an implant assembly comprising: a socket; exposing a desired spinous process; inserting the middle portion of the post between adjacent spinous processes to position the post substantially between a first spinous process and a second spinous process; sliding the second plate onto a portion of the second end portion of the post whereby portions of the first and second spinous processes are positioned in a space between the first and second surfaces; compressing the plates onto the first and second spinous processes; and maintaining compression of the plates onto the first and second spinous processes while affixing the first plate to the first end portion and the second plate to the second end portion, which are not present in Group II; the special technical features of Group II include a second post having a second end pivotally connected to the second surface and a first end spaced therefrom the second surface; wherein the first post is at least partially tubular, defining an interior longitudinal cavity, and wherein at least a portion of the second post is configured to be telescopingly received by the interior longitudinal cavity; and means for fixing the position of the second post relative to the first post, which are not present in Group I.

The common technical features of Groups I and II are fixation of spinous processes comprising: a first plate having a first surface; a second plate having a second surface; a post having a first end portion, a second end portion, and a middle portion.

This common technical feature is disclosed by US 2011/0022090 A1 to Gordon, et al. (hereinafter 'Gordon'). Gordon discloses fixation of spinous processes (bone plate assembly including at least one bone plate, polyaxially adjustable fixation elements and a polyaxially adjustable locking mechanism; abstract), comprising: a first plate having a first surface (first plate 102; figure 1; paragraph [0102]); a second plate having a second surface (second plate 104; figure 1; paragraph [0102]); a post (post 110; figures 1, 9A; paragraphs [0102], [0117]) having a first end portion, a second end portion, and a middle portion (post 110 includes a shaft 260 (middle portion) extending between a first end 262 (first end) and a second end which includes a head 264 (second end); figure 9A; paragraph [0117]).

Since the common technical features are previously disclosed by the Gordon reference, the common features are not special and so Groups I and II lack unity.